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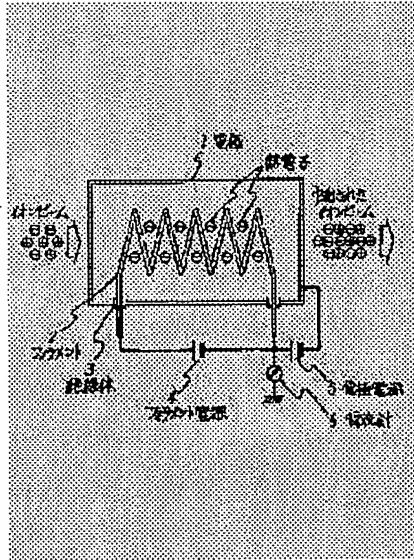
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(21)Application number : **04-011498**(71)Applicant : **NEC YAMAGATA LTD**(22)Date of filing : **27.01.1992**(72)Inventor : **SATO KATSUAKI**

(54) ION IMPLANTATION DEVICE

(57)Abstract:

PURPOSE: To provide an ion beam neutralization mechanism for ion implantation device, with which stable and efficient ion beam neutralizing performance is obtained. **CONSTITUTION:** An ion beam neutralizing mechanism is equipped with a filament 2 located on a cylindrical surface coaxial with the center axis of an ion beam, an electrode 1 provided on another coaxial cylindrical surface situated outermore than the filament, a filament power supply 4 for heating the filament, and an electrode power supply 5 which gives the electrode a potential lower than the filament. Because the energy of electron to be neutralized is low, the neutralization can be done efficiently. Also stable performance can be maintained because it is not likely being affected by the surface condition of constituent parts.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the neutralization device which neutralizes the ion beam which just carried out the electric charge in ion implantation equipment with respect to ion implantation equipment.

[0002]

[Description of the Prior Art] The example of a configuration of the conventional technique of the ion beam neutralization device of ion implantation equipment is shown in drawing 4. In this drawing, a filament 22 is laid in the direction of a right angle to the medial axis of an ion beam, this filament is heated according to the filament power source 24, and a thermoelectron is generated. It moves toward the secondary-electron-emission plate 28 which an ion beam side is forced into a thermoelectron in the migration direction since an electrode 27 is in abbreviation 20V low voltage from a filament 22 according to the electrode power source 25, and is in abbreviation 300V quantity potential from a filament 22 according to the acceleration power source 27, it collides there, and secondary electron is made to emit.

[0003] Then, when the just charged ion beam passes along the inside of the group of this secondary electron or the accelerated thermoelectron, it combines with these electrons and an ion beam is neutralized as a result. An ammeter 26 directs quantitatively the amount of the electron used for neutralization of an ion beam.

[0004] In addition, although each power sources 24, 25, and 27 and an ammeter 26 are usually installed into atmospheric air among the ion beam neutralization devices of above-mentioned ion implantation equipment, others are installed into a vacuum.

[0005]

[Problem(s) to be Solved by the Invention] By the ion beam neutralization device of the conventional ion implantation equipment mentioned above, association with short ****, an ion beam, and an electron is not efficiently performed for the time amount which touches an ion beam since the energy of secondary electron of the electron to neutralize is as high as about 300eV by about 20eV and the other electron and it is moved at high speed. Therefore, an ion beam was not fully able to be neutralized.

[0006] Moreover, the emission ratio changed with surface dirt, and emission of the stable secondary electron became difficult, therefore emission of secondary electron did not have stability in the neutralization engine performance of an ion beam, either, in order to be greatly dependent on the surface state of a secondary-electron-emission plate.

[0007]

[Means for Solving the Problem] In the ion implantation equipment which has the ion beam neutralization device which neutralizes the ion beam which just carried out the electric charge of the description of this invention said ion beam neutralization device The medial axis of an ion beam, and the filament arranged on a coaxial-circles cylindrical surface, It is in ion implantation equipment with the electrode arranged on an outside coaxial-circles cylindrical surface to the pan of this filament, the filament power source which heats this filament, and the electrode power source which makes potential of this electrode low voltage from the potential of this filament.

[0008]

[Example] Next, this invention is explained with reference to a drawing.

[0009] Drawing 1 is drawing showing the configuration of the 1st example of this invention. Drawing 1 shows the part installed into a vacuum, and the power source installed into atmospheric air is omitted. As shown in drawing 1, the ion beam neutralization device of this ion implantation equipment has the insulator 3 with which the coiled form filament 2 placed on the coaxial-circles cylindrical surface of an ion beam, the cylinder-like electrode 1 further placed on the coaxial-circles cylindrical surface of that outside, and a filament 2 and an electrode 1 are insulated electrically, and is constituted. Since the filament 2 serves as an about 1.5 times larger bore from the magnitude of an ion beam and opening of the both-ends side of an electrode 1, on the other hand, serves as an about 1.2 times larger bore from the magnitude of an ion beam, it can prevent an ion beam colliding with a filament 2.

[0010] Drawing 2 is drawing of longitudinal section showing the configuration of whole drawing 1, and explains actuation using this drawing. First, a filament 2 is usually made from a tungsten and is heated according to the current from the filament power source 4. Moreover, the electrode 1 serves as potential with several V-dozens V lower than the potential of a filament 2 according to the electrode power source 5. In the condition that there is no ion beam, since the several eV thermoelectron generated from the filament 2 has the potential of an electrode 1 lower than it, it produces repulsive force near the electrode 1, and the perimeter of a filament 2 is covered with it. When the ion beam by which the electric charge was carried out to dozens here forward KeV(s) passes, a suction force is produced between ion beams, and in an ion beam, it will be mixed, and will be combined, and a

previous thermoelectron will neutralize an ion beam as a result.

[0011] Drawing 3 is drawing of longitudinal section showing the configuration of the 2nd whole example of this invention. In addition, in drawing 3, the same sign has shown the similar part similarly to drawing 1 and drawing 2.

[0012] In this example, it improves about a filament and its power source, and two or more coiled form small filaments 12a and 12b are arranged in the shape of [of an ion beam] a coaxial-circles cylindrical surface. In this case, in consideration of the electrical characteristics of each filament becoming irregular, only a filament and the same number also arrange two or more filament power sources 14. In the case of this example, compared with the example spread previously, since the miniaturization of a filament is possible, the overall length of a filament can be short.****(ed). Therefore, it becomes possible to make low the electrical potential difference of a filament power source, and the difference of the FIRAMETO potential produced in ion beam shaft orientations becomes small. Thereby, neutralization of an ion beam comes to be performed still more efficiently.

[0013] Moreover, although the coiled form filament is used in the two examples described previously, actuation is the same also with a rod-like filament. However, by the field according [the direction which used coiled form hula MENTO] to the filament current, in order that a thermoelectron may move to an ion beam, performing the circular motion, contact time with an ion beam becomes long, and effectiveness becomes good.

[0014]

[Effect of the Invention] As explained above, since the low thermoelectron of energy was used for this invention, it becomes possible [neutralizing an ion beam efficiently], without using secondary electron and the accelerated thermoelectron for neutralization of an ion beam. Moreover, the filament which generates a thermoelectron has the effectiveness that stability of operation is high in order to use for dirt the electron emission principle for which is pile structure and it is hard to depend on the surface state of a component part.

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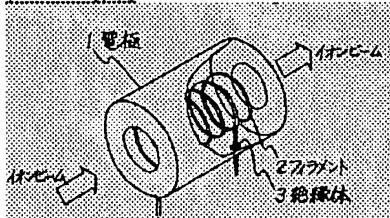
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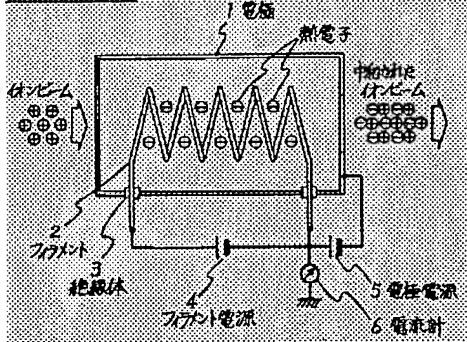
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DRAWINGS

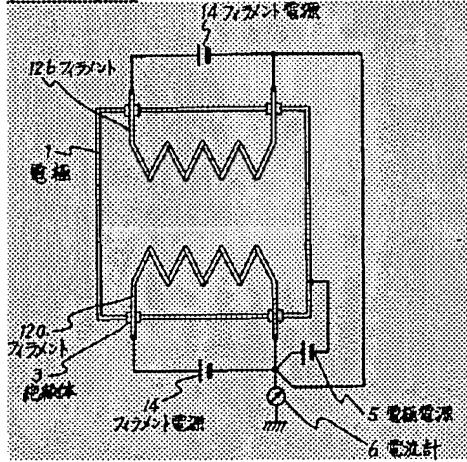
[Drawing 1]



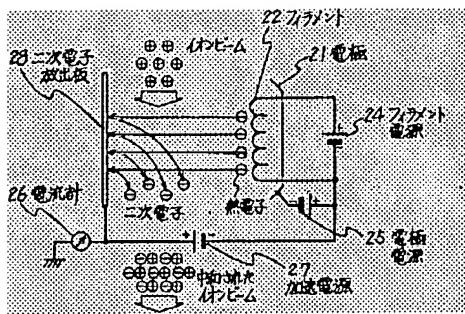
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]